Research and Scientific Edition in the Social Web: The Shared Science

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Abstract: In this paper, the social web as a work context for scientific research and the methodological features accrued to researchers by those work contexts are analyzed. Associated concepts to e-Science, Science 2.0 and Shared Science and their characteristics are proposed. Virtual Research Environments (VREs) are defined and analyzed taking into account their historical development since the first primitive environments based on messaging service and gopher, up to the current ones that use social web tools and services, focusing on the features accrued to VREs by the social web as regards the shared nature of science and research. Special emphasis on support to digital scientific edition is made -mainly on peer review- and a proposal for revision through social networks are made. On this point, some of the most frequent objections -mainly on experimental areas- are mentioned. The coincidence of methods and objectives between these environments and those of the revisions in Social Sciences in which Formative Research has more relevance are also analyzed. Furthermore, in this sense, meaning, importance and possibility of having live information from a research beyond what is published and that is on the cloud stand out. Finally, the paper concludes with the need for support from agencies and research institutions to open edition as well as to VREs infrastructure and digital edition in environments, with standards for communication in the social network as regards funding and projects.

Key Words: Social Web, e-Science, Science 2.0, shared science, Virtual Research Environments, VREs, Formative Research, digital scientific edition, peer review, cloud computing

1 Social Web

Social Web or Internet 2.0 includes services that bear no distinction between author and user: social networks, wikis, blogs, You Tube, …and this one would precisely be its distinguishing feature, its novel aspect in relation to the web: there is no personal mediation by computer specialists, or dependence on them. The main characteristic of the Social Web is that it has participatory services. Users of 2.0 technologies can relate to each other in a simple, direct and open way; they can share resources, and communicate in an immediate and simultaneous way. In most cases – but not always- this would imply a certain degree of interaction, of dialogue, i.e. others modifying and intervening our own message. Therefore, we highlight two features: the Social Web is participatory and interactive.

Research and Science

The issue to solve is whether scientific research –in its varied dimensions, activities and procedures- takes advantage from the participatory and interactive features technology favours in most working methods. This is apparently the case, as groups are able to share reflections, methodologies, resources and results.

However, it is worth distinguishing among at least three different levels: interactions between groups, interactions inside groups; but also considering that research is an activity of an individual dimension, of personal creation and motivation[1], interaction to put in touch in an open way the activity of different individuals at various stages of their elaboration [Rebium, 2010]: in planning, development, conclusions, and applications.

The contributions of the social web to scientific activity favouring shared activity can be classified in four areas or categories: to the development of one's own research, to the common or shared use of resources, to the common or shared exploitation of results, and to dissemination and evaluation.

In no case is it about processes or consecutive phases. The most noteworthy characteristic of social web is that the enabling of actions included in those categories can take place at any moment of the research process, with a strong formative character, regulating the activity itself as result of the interaction.

Development

From this perspective, in the first category, the social web offers possibilities and chances to share -during the development of research, to integrate several people and groups, assigning tasks in the context of an organised activity or in spontaneous fashion favouring other groups or people so that they can use our results and we can use others' through scientific social networks in a particular knowledge area, or specific social networks for research; or even through the chances of getting in touch among scientists with related professional profiles, or sharing data and information repositories designed for shared research, or through support services such as e-learning platform, computer centres or others that are necessary throughout the research process.

Resources

The second category is made up by the applications that allow researchers instant and interactive sharing of both resources and information they use, and of information related to the research itself: references, bibliographical quotations, web bookmarks or citation indexes.

Common or shared exploitation of results

In general terms, it has to do with the dissemination mentioned in the following section; but there is also a close environment formed by communities of researchers that become some sort of ecologic niches or *habitats* where, either among various disciplines or not, researchers shared resources they use in their work, or they follow

[1] With the onset of the new open environments and the implicit philosophy that gives foundation to *open source, open code, open access*… ideas of work ethic emerge again that imply the need to create and share. It is the new work ethics [Himanen, 2001 and Zapata, M.], which is set as an alternative to Weber's ethic. Work is understood in this context, as an activity that promotes communication, recognition and relationship, as opposed to work as what gives access to material goods, welfare or power. Traditional work ethics as stated by Weber (1904-1905; Transl. 1930).

the researching paths that are related to their owns. They are all followed and being followed.

Dissemination
The dissemination of the results of the research is made through scientific publishing, on paper first, in digital format later on, and now either on the web or in a combination of the three formats. The social web allows a different sort of dissemination, with more possibilities; the first one, the possibility of disseminating results in an open and interactive fashion, and the second and more desirable one, of allowing the user to engage in a dialogue with the author allowing a fruitful phase of preprints and a later dissemination of more definite and outlined results in the revision. There is a fourth group of applications which share the feature of allowing the dissemination of research results in an open and interactive fashion. Here, we include services for promotion of information based on RSS technology, mainly in blogs and wikis, with large capacity for syndicated dissemination.

Assessment / Revision
Revision in digital scientific edition is the first requirement to be fulfilled, the genuine one in dissemination so as to be present in citation indexes, in standard agencies and in repositories. Methodology is highly refined; journal management and publishing systems in digital publication – being OJS the most widespread one, include many of the services already offered by the social Web, although social networks introduce new and varied possibilities to refine contributions as regards originality and relevance. Social networks also have naysayers, as we will later see. It is also appropriate to include social network applications that foster interaction among involved agents in this section. Of all phases in scientific dissemination, revision is the one in which methods and tools for the social web could be more useful.

2. The concept of e-Science, Science 2.0 or Shared Science[2]

The technological basis of knowledge society offers new tools to establish relationships, to communicate and to produce knowledge that favours creativity and dissemination processes, those of researchers included. They can use both of them fostering new ways of working from a methodological perspective, and disseminating and interacting in their processes, or revising results.

In this context, the concept of e-Science or Science 2.0 is understood as the scientific and research activity to which new support technological resources are applied with the consequently opening for new communication possibilities that enable scientist to perform their activity and to communicate their output in an interactive and participative way, and with open resources. This means an innovation in the working methodologies for scientific research and output.

To sum up, REBIUM [2010] states that science 2.0 is the application of social web technologies to the scientific process. But there is more to be said: science 2.0 is the application of social web technologies to the scientific processes and to the science dynamic, being affected in her working methods.

[2] [REBIUM, 2010]

3. Virtual Scientific Research Environments (VSREs)

E-science takes place in environments formed by tools, information and people: Virtual Research Environments (VREs) or Virtual Scientific Research Environments (VSREs). [Fraser, 2005].

Initially, VREs are defined as expected from their name and from other similar environments, such as Virtual Learning Environments; and they are formed by the infrastructure and digital services that allow research to take place.

In this context, the concept of VRE initially includes computer and information infrastructure, and it is still like this as no science can be currently considered without them. However, VREs are more than that: they are web-based resources that help scientists so that they can have huge amounts of data for their work, using distributed computer systems. They can use these data thanks to the development of on-line tools to handle contents and a middleware within a frame that is coherent to all disciplines and types of research, with standards for communication and data distribution, and with standard environments as regards look and feel, and processing options.

Currently, a VRE is best defined as a frame within which tools, services and resources can be connected. The idea of connection and exchange is fundamental. Therefore, it is hard to imagine a VRE belonging to just one institution, and even harder to only one department or research group. To make it meaningful, a VRE should be related to a wide or **global** group of institutions. The evolution is similar to that of managed Virtual Learning Environments (VLEs) – it is the sum of services and systems that together give support to teaching and learning processes at a particular institution and eventually to the rest of the institutions. A VRE is thus, the result of joining existent and new components to support research process, adapted to any activity or function. However, it is assumed that a large proportion of the existent components will be heterogeneous and distributed.

The problem is that, as it happens with other virtual environments (a learning virtual environment, for instance) a lot of emphasis is placed on the architecture and the norms instead of on specific applications. As Atkins, D.E. et al (January 2003) points out, a VRE should show a holistic vision: a VRE is more than middleware, and however, its possibilities to process information and work affects research methodology.

4. Social Web and VREs

In any case, the social web is characterised by its open nature as regards information in its access and edition phase. Basically, three aspects stand out: information framework, service interconnection, and above all, the contributive nature of the work that takes place on the web, in a collaborative fashion and often generously.

We have stated that the social web introduces significant methodological chances in scientific activity. As it is, the main feature the social web introduces in scientific work environments is interaction and contributive participation.

It is worth mentioning the interactive feature the web elicits from these environments, and defines it [Zapata, 2003]: digital technology and Internet allow fluid communication both ways, or in a multidirectional sense. A system is interactive if it takes advantages from these possibilities to achieve interaction in the activities that take place at a certain moment – research, learning, or any other type of activities. That is to say, to achieve that research activity reaches its social dimension, where the other researchers and the group take part in the activity of each individual so that

replies should not be deferred or distant from the time when the need arose, or that replies should not be scarce or insufficient, null or rigid, replies should not lose the evocative power immediacy provides. The answer should be individualized –if it is general, it loses its capacity to suggest and evoke that personalized and immediacy replies have. To sum up, a system would be more interactive the more it gives room for dialogue among individuals or with the system, so that each intervention finds a suitable reply depending on its nature, that it is immediate and differentiated.

The multidisciplinary approach is equally important. VREs [Fraser, 2005] have the potential to be deeply multidisciplinary both in their use and in their development. At least, it is expected that the activity will be multidisciplinary, integrating information science with other disciplines to put together methods and knowledge from each of them. This fact entails a challenge for some, such as social science and humanities researchers, whose methods and terminology are radically different from those ones in the computer sciences. Furthermore, science has to be shared so that obtained results in a certain area can be used by others not considered *a priori*. No one knows which the frontiers of knowledge would be. One of the features of knowledge society [Stehr, 1994] is that it gives an end to the fragmentary characteristic that Science has held up to know, as typical since the *trivium* and the *quatrivium*.

The shared nature of science and research

A research process has two typical characteristics, regardless of nature and context research:

- The formulation of a hypothesis or a model that describes reality[3].
- An experimentation that brings evidence about the thesis nature of the formulated hypothesis or the validation of a suggested model.

Regardless the scientific method and the chosen option for demonstration or validation, there are teams participating in all stages of research exchanging proposals, formulations and materials. The social web allows sharing and taking all the information into account at any moment, as well as the possibility of recording it, facilitating thus the interactive flow and creating a community atmosphere. It also outlines profiles of researchers and groups. Therefore, the social web delimits areas of performance through this flow, and help the convergence of people with common or complementary interests.

In this way and through the facilitation of workflow and relationship within the scientific community, the social web oversteps the formal boundaries as research groups have traditionally configured them, adding new profiles and components.

It is all about, then, opening participation to people and resources. Therefore, the need arises for considering the profile of individual researchers, read their works, and taking into account that participation is the main feature of the social web, researchers' and research teams' individual webpages should be included as "open science" resources in order to share researchers' resumés, results and research lines, projects and others in an effective way.

[3] It is not always the case that research is produced by contrasting hypothesis; there are other methodologies, such as Formative Research or Design Based Research [Zapata, 2010, and Rinaudo and Donolo, 2010] which, even including this structure in some part, do not entail the end of the experiment to reach conclusions. It is mainly applied in instructional design. But even in these cases, or precisely in these cases and even more fruitfully, it is more relevant to work on a social web.

Individual profiles, personal work, groups, curricula are all constituent part of the definition of professional social webs, as their young tradition sets.

5. Social Webs

> *In addition [*Royal Society, 2011]*, the rise of the social web and, in particular, social networks has the potential to dramatically change the way scientists collaborate.*
> *Could an aspiring PhD student find a supervisor through Facebook or Twitter? Will it become as normal to 'meet' online as at a conference? Although about 90% of all collaborations begin face-to-face, these advances in communication reduce the dependency on physical place but do not (yet) render face-to-face communication unnecessary. Some question whether they ever will.*

The new generation web is characterised by the exchange of information, by being participatory and interactive, without mediation of other agents beyond the implied ones. It includes blogs, wikis, but above all, the all-inclusive application that gives shape to everything including what was mentioned above is the social network. It is the most significant part of the social web.

It is thus, that the social web in the science 2.0 context assumes a community of individuals who use participatory and interactive technologies for the exchange of information in the context of a research or in tasks related to it.

The social web can reside on a platform that holds, besides profiles and interconnected personal webs, blogs, wikis, a virtual laboratory, a Learning Management System (LMS), surely a server for local nets management, Content Management Systems (CMS), and others, but mainly a social network service.
Practice has shown that relationships among all type of professionals, and for their own purposes, have found an ideal room for development in social networks. If this is so, it can be inferred that it would also be ideal for scientific researchers, both for their own purposes and for academic and professional ones.

The Rebium report [2010] and RedIris work seem to endorse the option of one or more specific scientific networks. It is worth asking about their scope and whether this scope would be limited or not. Because if there is one or more specific networks there would be issues to solve as regards intercommunication, communication standards, if they would be fragmented by countries, speciality, scientific domain, or by certain types of communities. Specific networks have, besides, the difficulty of learning how to use a new and different environment from the one users handle for their personal activities. Another option is that in the same sense there is no specific scientific e-mail, there should be no specific scientific networks, forming groups in general purpose networks (Facebook, or even more LinkedIn, which is quite complete as regards its group options). The scientific feature of the network is given, after all, by use.

It is worth mentioning the applications for distributed learning that can be included in open science environments such as LMS (Moodle, Blackboard, and so on), and platforms for videoconference (Elluminate, which is specific for e-learning, or Google, Skype or Messenger environments).

Social networks are then, the most complete exponent of the so-called social web, and hence, of the scientific social web. Researchers and other people involved in

scientific activity (editors, revisors, teachers, application developers, documentalists...) individually or through entities or groups get in touch and communicate with each other instantaneously, simultaneously and interactively to share results, projects, resources, information and documentation.

Therefore, social networks are, by definition, the answer for research team work in common or close topic areas and interests, to share, and common creation of research developments in the production, experimentation, hypothesis formulation stages, and others.

Besides, there is an inverse influence from the networks on the scientific methodology which enables a faster and more fluid interaction, and above all, of larger research teams or of different teams with the same objective. Something similar takes place to what happened at the beginning of Internet with Fermat's Last Theorem, or Fermat-Wiles theorem Gopher and e-mail; 300 years after being stated in its first formulation, it was nominally demonstrated by Wiles, but with the collaboration of Richard Taylor, whom with he kept a lively correspondence with the transfer of demonstrations and objections, and previous to Flach and Faltings works, and discussions with Weil, Ken Ribet and Karl Rubin about the authorship of its demonstration [O'Connor, J. J. and Robertson E. F., February 1996] [Mathematics Information Service, Unified Archive, 2007].

Far away from these starting points of Internet as element in scientific debate, social networks are excellent virtual environments for research, as they offer all the services a research team may need integrated in a single unit: communication platforms, a medium to share and manage resources and documents, a discussion groups.

The functions we have seen as common in networks, convenient for the goals we will describe in the remaining part of this paper, and that really exist in some networks are the following:

A. Wall.- It is the most common and best known function of the social network. It allows posting comments, links and objects of all sorts to our contacts in our area, and we can post them in our contacts' areas. It's the most common form of instant and interactive communication for a group or network. Both for this function and for the following ones, it becomes necessary after use to establish certain norms for style as well as a minimum supervision for truthfulness. In social networks for general purposes, it is possible to post criticisms and recommendations.

B. Profile.- It is made up by the set of most outstanding features of our research personality in this case, making them public and priorised by the account owner.

C. Personal page.- with research lines, projects and publications. It may or not be a specific function, but in any case, this information is a must. Furthermore, it is also a good idea to post information according to standards on subject catalogues such as the Standard Nomenclature for Fields of Science and Technology from UNESCO[4].

D. CV with work experience education.- This function as well as the following ones are alike others that are included in almost all professional social networks.

[4] http://unesdoc.unesco.org/images/0008/000829/082946eb.pdf

E. Personal network (contact list).- In relation to what is mentioned in this paper as regards revision, it is desirable for contact list to be structured in different levels so as to share information in a selective and oriented way.

F. Interest groups.-

G. Exchange with other networks.- Facebook, Twitter, LinkedIn, and standard webmail services such as Gmail,…

H. Function "Follow...".- It allows to follow the output of a person, group, organization or institution of interest from its output, news, or any outcome of the activity.

I. Corporate contacts.- (similar to corporations) of departments and research teams. It is desirable that contacts are made not only among individual researchers but also among any related entity linked as contact by a researcher or group.

J. Notifications on news about contacts, magazines, research, and others. It is desirable for notifications to be set for topics, publications, etc.

K. Include similar key to "Add This2.- "Add This" tool is particularly interesting as it produces the opposite effect from the other tools: it allows the inclusion of links or objects from web environments or others and share them to the web selectively.

L. Upload from the net images and videos, besides files and links in different environments.

M. Webmail Service

N. Chat

O. Videoconference

P. Events y calendar.- It allows to set dates with notes and explanations about relevant events and share them with groups, individuals, and to select them according to levels or other concepts through notifications.

Q. Forums.

R. Internal search.- In one way or another, different applications offer a search or classification engine. This option is set as a different tool from the rest.

S. Linear and non-linear (tree) environments.- This option is to know which application we are in within a working framework.

T. Job offers in the scientific area.- It is important not to forget that researchers are employees affected by offer and demand in the labour market. And those options let them adapt their researcher profile to a certain environment.

U. Recommendation.- Recommendations should be understood as worthy guarantee and a commitment that gives credits to profiles and CVs.

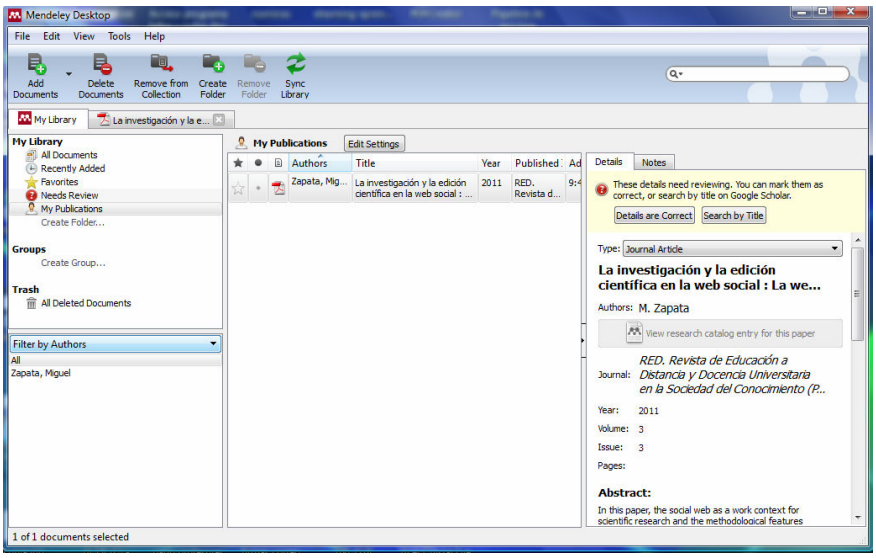
V. Labelling for all types of resources.- This function makes sharing easy and saves virtual space and system resources.

W. Distribution tool for files, writing and participatory edition.

X. Subscription through invitation.- It is a way to avoid intruders and interest that are alien to those of the network.

Y. Communication with standard networks to invite.- Most researchers are already in general purpose networks or in other scientific networks such as Mendeley. This resource, and the one that allows message and resource sharing, posting and the "Add This" key enable a welcomed openness and exchange among communities and researchers, editors, revisors, etc.

Z. Desktop Interface.- It let us manage our social network from a single device and in a single window on our desktop, being Mendeley, maybe, the best known one.



6. Dissemination of science, publishing and revision in social networks

Dissemination of experiences and research results is a fundamental stage in the elaboration and creation process of science. It makes the basis of its growth. It is different borderline from the one assumed for communication in VREs, but it should not be different or incommunicated with it. In fact, there is a stage –the one related to peer review- that basically shares the nature and method of central scientific work: analysis of relevance, inclusion in the context of research or research path, validity of the method used and others. As regards topic, there is more than this similarity; there is also a complex relationship system among authors, revisors, editors, versions, etc which is quite parallel to the one established in research communities.

Currently, the most dramatic progress is the boom of open access edition, as an accepted, assumed, and official replica in countries such as the United Kingdom and political instances such as the European Union in its policies and orientations for member countries.

Open access of scientific edition assumes –as already stated- a complex system of actions, decisions, analysis and elaborations which, up to now, are managed almost exclusively in two different ways: in a digital-traditional way, in which editors manage it through e-mail and templates, with mailing among authors, revisors and

editorial boards being listed and saved in folders in their computers, visible to any acting evaluation agency, or in an automatic way through management and publishing systems, of which OJS is the most renowned.

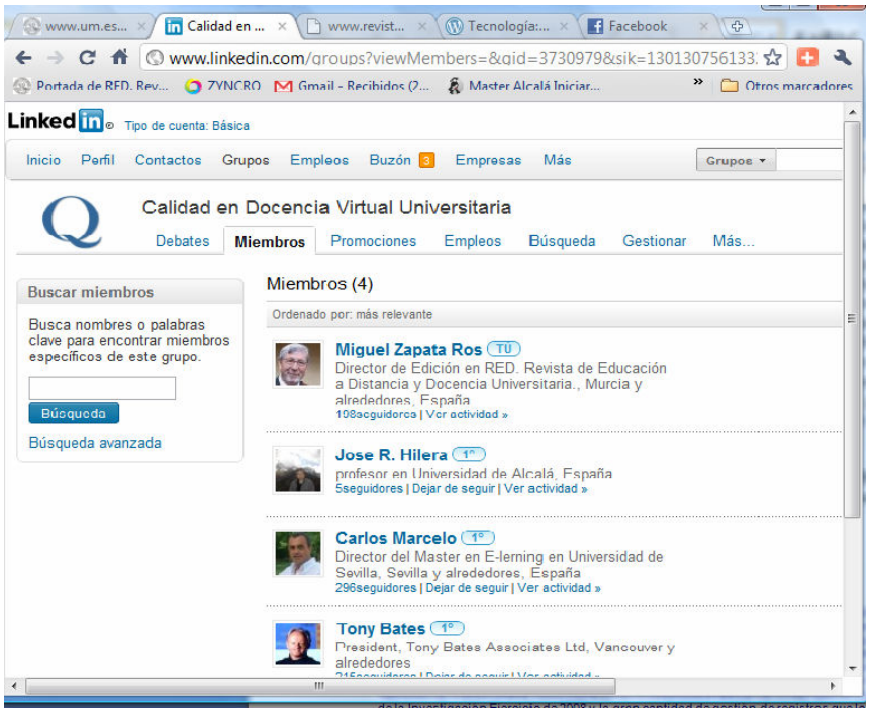
In any case, this process implies a system of relationships with strict protocols, relatively inflexible, and not including a significant agent: the reader or user of the research, a fact which can offer a new dimension to the dissemination of science.

The social web allows for a different dissemination, with more possibilities that might help overcome in part those limitations; the main one –besides being open- by making it interactive and thus, allowing the user participation in a dialogue with the author, but also, we believe more willingly, because first it allows a number of preprints, and secondly because it allows for later dissemination of more definite and outlined results in the revision. Without analysing those applications that share the possibility of open and interactive dissemination of scientific results including information and notifications services based on RSS technologies and above all blogs and wikis with great capacity for syndicated distribution, we will consider a key aspect: the revision of originals.

Peer-evaluation of originals is the first requirement to fulfil in scientific edition either on paper or digital in order to be present in citation indexes, in standard agencies and in repositories. Their procedures follow a definite and refined methodology. Digital management and publishing systems– being OJS the most widespread one- include many of the applications the social web offers. However, the social web introduces new and different possibilities for depuration of contributions as regards originality and relevance. It also has some naysayers as we will later see, mainly because open revision may change the progress of the scientific methodology. However, what can be an obstacle in some subjects may be an advantage in some others, mainly in formative ones. It is adequate to include social web applications in this section, and social network applications in particular mainly because of the interaction among participant agents they foster.

Currently, we are revising the original articles of RED in this way, in its classic section about “Instructional Design and Virtual Learning Environments” and “University Teaching in Knowledge Society”.

Revision is organised through open access to originals in groups at LinkedIn network.



Likewise, we are participating in an assessment and analysis process that is taking place at RedIris-Red Académica Española (CSIC), to complement first and achieve a possible migration from the discussion lists and the virtual communities in BSCW to a scientific social web. At this point, we are considering Zyncro environment and counselling to include ways of functioning typical of the social web.

7. Objections

As regards objections, peer revision through the social web has naysayers. The fact that readers biased by an interest which may not be exclusively the one of a researcher, or readers who are not qualified enough may demerit research or its results. It is worth mentioning the case of "longevity gene." During the methodology revision [Mandavilli, January 2011] of a research process, documents of the experimental process were published openly in the social network. Those unedited documents, had conclusions on data–or conclusions could be drawn from that data- that related data the complete genome with the longevity genes. But there was a wrong association between control groups and different DNA sequence groups. This isolated data was taken by the press that speads scientific information and headlines such as "Scientists discover keys to long life" in Wall Street Journal, on July 1st, 2010. "Who will live to be 100?" the National Public Radio said a day later. After several vicissitudes, clarifications, and debunkers, and with a lot of effort, the auhors voiced themselves but with much less success than the first headlines. This event happened months later, in November, when Nature asked the main researcher, Paola Sebastiani, biostatistician from the University of Boston, about this issue. She said that both she and her colleagues "feel it is premature for us to talk about our experience because this is still an ongoing issue". All this happened even though David Goldstein, director of Duke University's Center for Human Genome Variation, published and justified that everything was a mistake when he expressed his concerns to a blogger in Newsweek Magazine the very same day the article was published.

These facts did not cause much variation in the research process except for the probable intimidation on the researchers caused by the repercussions on the media of their work, and the state of opinion those incidents produce on the media.

However, this quick and open reaction becomes an advantage for two reasons: because it deletes the bad job quickly, and because it enables research with a strong formative character, as it does not become necessary to wait for the research to finish in order to evaluate results. In some fields of Social Sciences and Humanities, particularly Pedagogy and Psycopedagogy, this methodology becomes particularly useful due to the characteristics of the phenomenon being researched. It happens in this way in instructional and learning processes.

On the contrary, for many researchers, the rhythm and tone used in on-line revision and in public may be intimidating. Sometimes it may even be felt as an attack.

That is why it is necessary to develop the experiences on this matter at the current stage so as to foresee and study how authors reply to criticisms of all sort and coming from all directions, as well as to moderate or narrow participation in the revision. To set an order in this predictable chaos, it seems appropriate to establish a new set of revision rules as well as the on-line infrastructure to support them. The idea of open peer review is not new. We have already dealt with it in relation to *Fermat Last Theorem.*

Because the use of Internet started its growth in the 1990's, there are scientific editors –even on paper- who have argued for on-line revision stating it may and should replace traditional peer revision process as a pre-stage before publishing, but there is no reason for not doing it during publishing and even after it. "It makes much more sense in fact to publish everything and filter after the fact" Cameron Neylon states [Mandavilli, January 2011 y Neylon, 2011], a senior scientist in Science & Technology Facilities Council, a funding organization in the United Kingdom.

Public debate prior to publishing is a frequent practice in some fields, mainly in Mathematics and Physics, but also in Social Sciences and Humanities, as mentioned above. Most researchers in these fields leave their preprints in a server. This has been like this for the last two decades. As blogs, preprint repositories, and wikis have become more commonplace, the practice of submitting preprints has also become more popular.

However, scientists in other fields seem to be less prone to get involved in a debate before publishing. Biologists, in particular, as mentioned about the longevity gene [Sebastiani et al. 2011] are reluctant to publicly speak about their own work, or about their colleagues' for fear of being mocked by competitors or for not respecting respondents' privacy in future works. This adds to the lack of support -due to unspoken mistrust, but tacitly acknowledged- to on-line activity on the part of project evaluation boards, with the consequent funding problem.

Another difficulty that is mentioned [Mandavilli, 2011] is how scientists from the experimental sciences, Mathematics, Physics, etc. can face this ad-hoc analysis of those documents, since they are used to the rigour of experimental designs based upon contrast of hypothesis and mathematic rigour. Non-structured, rebel and often anonymous, comments to on-line documents can be exasperating to experimental scientists, as they commonly use more conventional means to debate. The expected reply is [Wolfe-Simon, in Manavilli, 2001], "Any discourse will have to be peer reviewed in the same manner as our paper was, and go through a vetting process so that all discussion is properly moderated." This type of issues poses -without taking it to those extremes- the need for moderation, for moderators who check comments.

8. The Cloud

For the reasons stated above, "common to all disciplines is the impetus to publish and for that process to include peer-review." [Fraser, 2005]. Projects and policies in the EU and particularly in the UK [Fraser, 2005] tend and favour open access to research results and other similar policies for publicly-funded research. This situation leads basic research infrastructure to entail fostering the application of institutional repositories as part of research basic infrastructure. [Research Councils UK., 2008]. But repositories in this context lack a fixed and stable character; they are useful to publish, to debate preprints and to evaluate. In fact, with services such as E-LIS, blogs, social network, or the ones that magazines offer in their own sites (OJS included), authors publish individually and put their works under consideration of their colleagues. Networks guarantee protection over intellectual property and against plagiarism.

The "cloud" effect –typical of the social web- is clearly seen here as well. And many times this service is part of the institutional web. The output may be present since the very first moment of its first draft (in fact, this is what I am doing with this very same paper, whose first five pages where posted in E-LIS[5]. Let's remember that "cloud" also known as "cloud computing" is closely linked to social web concepts: cloud computing or just cloud is a set of applications for management, flow and storage, software, method and data access system and services that do not require a specific technical knowledge from the final user. Also, the place where the user places

[5] See http://eprints.rclis.org/bitstream/10760/15458/1/borrador%20definic.pdf , retrieved on 03/30/2011

their output to be stored, managed, used, and made visible to other users. In this diagram, the user is not interested in the physical location of the information or in the service configuration.

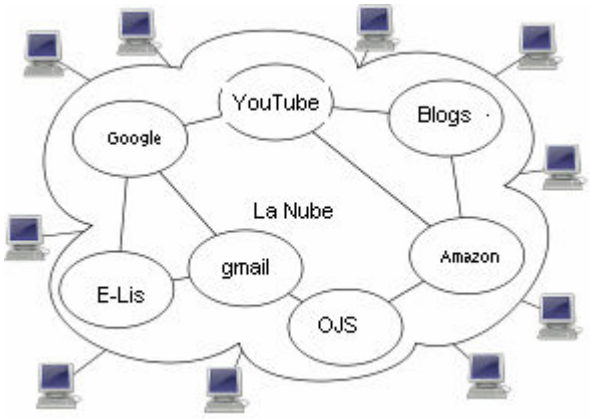


Figure 1: The Cloud

This implies that research repositories offer storage and access to research results in any stage of their development. This is the key of their potential: works are alive at all times.

Therefore, the cloud (the research repository in the cloud) has long reach and path. It is not for e-prints and research results; it also includes projects, drafts, and alternative or different versions that tell us about their history. In any case, this also implies a longer term for preservation of the temporary and final research results, not only of data but also of documents containing data collection, creation and analysis. In fact, projects (originals and versions), data, publications based on them, communication flow (messages and debates in forums), "grey material"[6], notepads and other forms of communication in the cloud should be preserved intact. It is important to preserve all this in a research environment, as almost all material has been born and grown digitally. The development of future research as from today depends on this preservation. [Hey, T. and Trefethen, A. January, 2003])

9. Conclusions

On the basis of experience on the practice of digital edition, on studies for this paper and the ones based on Red Iris virtual communities, and on the social network platform, we could state a number of conclusions.

The development of research virtual environments and the underlying social web infrastructure must be promoted through projects and reports. Projects should be

[6] "Grey material" is all scientific output not used by publishing houses, i.e. everything used by the research community that is not "cleaned and refined" to be included in a conventional publication.

evaluated formatively so as to cause changes and reorientations of the processes and development of tools and environments, support regulations included. And in any case, lines or projects should not be abandoned, or even less start new ones, without uncovering the objectives and causes for giving them up or for not following them.

Parallel with experimentation, research, and reach of VREs, there should be convergence between orientations an institutional initiatives, and gradual acceptation of open standards, open source software, and open access repositories.

It often happens that good projects are aborted by lack of concordance between personal or group expectations, and development possibilities. Users expectations have to be managed. There is always an inherent risk in the development of the infrastructure through projects of trying to offer too much, too fast.

The complexity of technical development and the associated cultural change has to be adequately taken into account in their interactions.

Institutions must consider financing VREs, as well as the edition of research results among their projects to finance, through adequate budgeting in a context of strategic policies for support. This requirement is particularly evident in relation with the future of institutional repositories, it must be a key component in institutional support and in e-infrastructures, both at state as well as university level.

Finally, there are three characteristics which should impregnate the framework and infrastructure of networks and social webs: interoperability with common communication standards, multidisciplinarity and attention to researchers' cultural change. Likewise, adjustment of expectations, formation for users and administration should be considered and made evident through financing edition, and support and maintenance of virtual environments in research projects.

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References

Daniel E. Atkins, D.E. et al. (January 2003). Revolutionizing Science and Engineering Through Cyberinfrastructure: Report of the National Science Foundation Blue Ribbon Advisory Panel on Cyberinfrastructure. Retrieved from http://www.communitytechnology.org/nsf_ci_report/report.pdf el 25/03/11

Fraser, M. (30-July-2005) "Virtual Research Environments: Overview and Activity", Retrieved from http://www.ariadne.ac.uk/issue44/fraser/intro.html

Hey, T. and Trefethen, A. (January 2003). The Data Deluge: An e-Science Perspective (Preprint). "Grid Computing – Making the Global Infrastructure a Reality". Retrieved from http://eprints.ecs.soton.ac.uk/7648/1/The_Data_Deluge.pdf el 30/03/11

Himanen, P. (2001). The hacker ethic and the spirit of the Information Age. Prologue by Linus Torvalds. New York: Random House (in Spanish, Destino, 2002: Himanen, Peka (2001). La ética del hacker. Ediciones Destino. Col. Destinolibro, vol 482. Barcelona).

Mathematics Information Service, Unified Archive, 2007. College of Arts & Sciences [CAS] is the University at Albany's. Department of Mathematics and Statistics. Wiles, Ribet, Shimura-Taniyama-Weil and Fermat's Last Theorem. Retrieved from http://math.albany.edu:8010/g/Math/topics/fermat/

Mandavilli, A. (January 2011). Peer review: Trial by Twitter. Blogs and tweets are ripping papers apart within days of publishing, leaving researchers unsure how to react. Published online 19 January 2011 | Nature 469, 286-287 (2011) | doi:10.1038/469286a. Retrieved from http://www.nature.com/news/2011/110119/full/469286a.html el 01/04/11

Neylon, C. (March 2011). Open Source, Open Research and Open Review. Retrieved from http://cameronneylon.net/blog/open-source-open-research-and-open-review/ el

O'Connor, J.J. and Robertson, E. F. (February 1996). Fermat's last theorem. In Turnbull WWW Server, School of Mathematical and Computational Sciences University of St Andrews. Retrieved from http://www-groups.dcs.st-and.ac.uk/~history/HistTopics/Fermat's_last_theorem.html

Research Councils UK. (2008) Position Statement on Access to Research Outputs. Retrieved from http://www.rcuk.ac.uk/access/ el 29/03/11

REBIUN (2010). Ciencia 2.0: aplicación de la web social a la investigación. Retrieved from http://eprints.rclis.org/19304/

Rinaudo, M.C. y Donolo, D. (2010). Estudios de diseño. Una perspectiva promisoria en la investigación educativa. RED - Revista de Educación a Distancia. Número 22. 15 de mayo de 2010. Retrieved from http://www.um.es/ead/red/22 on 05/15/2010

Royal Society (2011). Knowledge, networks and nations. Global scientific collaboration in the 21st century. Pág. 66-67. Retrieved from http://royalsociety.org/uploadedFiles/Royal_Society_Content/Influencing_Policy/Reports/2011-03-28-Knowledge-networks-nations.pdf on 03/29/11

Sebastiani, P. (2010). Genetic Signatures of Exceptional Longevity in Humans. *Mendeley*. Retrieved from http://www.mendeley.com/research/genetic-signatures-exceptional-longevity-humans-26/ on 04/01/1.

Stehr, N. (1994). Knowledge societies. London: Sage Publications.

Weber, Max, (1904-1905; Tran. 1930) The Protestant Ethic and the Spirit of Capitalism. Routledge, Londres, 1992. Translation into Spanish: La ética protestante y el "espíritu" del capitalismo. Alianza Editorial, Madrid 2001.

Zapata, M. (2010). La investigación formativa y la investigación basada en el diseño: Dos perspectivas de alcance. RED - Revista de Educación a Distancia. Número 22. 15 de mayo de 2010. Retrieved from http://www.um.es/ead/red/22 on 04/02/2011

Zapata, M. (2007) La profesión docente en la sociedad de la información, nuevas dimensiones: La ética del trabajo. Pág. 8. RED - Revista de Educación a Distancia. Número 18. Retrieved from http://www.um.es/ead/red/18 on 04/02/2011